

Amendments to the Specification

Please amend the specification as follows:

Please insert the following paragraph at page 1, between lines 5 and 6:

This is a Rule 1.53(b) Divisional Application of Serial No. 10/154,920, filed May 28, 2002, which is a Rule 1.53(b) Divisional Application of Serial No. 09/672,779, filed September 29, 2000 which is a Rule 1.53(b) Divisional Application of Serial No. 09/210,948, filed December 15, 1998.

Please amend the paragraph at page 1, line 8, as follows:

This invention generally relates to a rewriteable optical disc, an optical disc recording apparatus, an optical disc recording method, and a storage medium for storing an optical disc recording program, and specifically to a rewriteable optical disc, an optical disc recording apparatus, and an optical disc recording method for facilitating dubbing, and a storage medium for storing an optical disc recording program for facilitating dubbing.

Please amend the paragraph at page 4, line 22, as follows:

With such a construction, the second audio stream for dubbing has the same source as the first audio stream. This enables the audio stream to be ~~performed~~ used for the performance of a partial dubbing. Furthermore, the second audio stream having ~~been~~ had partial dubbing performed ~~the partial-dubbing~~ includes the same audio data as the first audio stream in a part other than the part in which the dubbing data is recorded. Therefore, the reproducing apparatus needs not switch between the first and second audio streams during the reproduction.

Please amend the paragraph at page 6, line 3, as follows:

With the above construction, it is possible for the recording apparatus and the reproducing apparatus to manage whether the dubbing stream has ~~been~~ had dubbing performed ~~dubbing~~ by referring to the management information.

Please amend the paragraph at page 7, line 6, as follows:

With the above construction, the dubbing stream is multiplexed into the video objects beforehand, and an area is secured in the dubbing stream so that either audio data or sub-picture data is recorded in the area. This facilitates the dubbing. Furthermore, it is possible for the recording apparatus and the reproducing apparatus to manage whether the dubbing stream has ~~been~~ had dubbing performed ~~dubbing~~ by referring to the management information.

Please amend the paragraph at page 8, line 6, as follows:

The above object is also fulfilled by an optical disc recording apparatus for recording one or more video objects onto an optical disc, where each of the one or more video objects ~~include~~ includes a video stream, a first audio stream and a second audio stream, the optical disc recording apparatus comprising: an input unit for receiving the video stream and the first audio stream; an audio stream generating unit for generating, based on the received first audio stream, a second audio stream which is used for dubbing; a multiplexing unit for generating the one or more video objects by multiplexing the generated second audio stream, the received video stream, and the received first audio stream into the one or more video objects; and a recording unit for recording the generated one or more video objects onto the optical disc.

Please amend the paragraph at page 9, line 20, as follows:

The above optical disc recording apparatus may further comprise: a reading/writing unit for reading a video object from the optical disc; a first buffer unit including a first reading buffer and a first writing buffer, the first reading buffer storing a part of the read video object, and the first writing buffer storing a part of the read video object which is to be written onto the optical disc; a second buffer unit including a second reading buffer and a second writing buffer, the second reading buffer storing a part of the read video object, and the second writing buffer storing a part of the read video object which is to be written onto the optical disc; and a dubbing control unit for performing a control so that while the video object is either ~~of~~ read from ~~or~~ and written ~~from~~ onto the optical disc using one of the first buffer unit and the second buffer unit, the second audio stream in the part of the video object stored in the reading buffer of the other one of the first buffer unit and the second buffer unit

is updated, and the part of the video object including the updated second audio stream is stored in the writing buffer of the other buffer unit, where the reading/writing unit sequentially writes the part of the video object in the first writing buffer and the part of the video object in the second writing buffer onto the optical disc, where after the second audio stream is has had dubbing performed ~~dubbing~~, the dubbing control unit is capable of restoring the second audio stream to a state before the dubbing by copying the audio data of the first audio stream to the second audio stream.

Please amend the paragraph at page 11, line 14, as follows:

The above object is also fulfilled by an optical disc recording apparatus for recording one or more video objects onto an optical disc, where each of the one or more video objects ~~include~~ includes a video stream, the optical disc recording apparatus comprising: an input unit for receiving the video stream; a dubbing stream generating unit for generating a dubbing stream which is used for dubbing; a multiplexing unit for generating the one or more video objects by multiplexing the generated dubbing stream and the received video stream into the one or more video objects; a management information generating unit for generating one or more pieces of management information which respectively correspond to the one or more video objects, each of the one or more pieces of management information indicates whether dubbing has been performed on the dubbing stream in the corresponding video object; and a recording unit for recording the generated one or more video objects and the generated one or more pieces of management information onto the optical disc.

Please amend the paragraph at page 12, line 6, as follows:

With the above construction, the optical disc recording apparatus multiplexes the dubbing stream into the video objects beforehand during the first recording onto the optical disc. As a result, it is possible to generate an optical disc in which video objects facilitating the dubbing of audio data or sub-picture data are recorded beforehand. Furthermore, it is possible for the recording apparatus and the reproducing apparatus to manage whether the dubbing stream has ~~been~~ had dubbing performed ~~dubbing~~ by referring to the management information.

Please amend the paragraph at page 15, line 4, as follows:

The above computer-readable storage medium may further comprise: a program segment for instructing the computer to, after the second audio stream ~~is~~ has had dubbing performed ~~dubbing~~, restore the second audio stream to a state before the dubbing by copying the audio data of the first audio stream to the second audio stream.

Please amend the paragraph at page 15, line 12, as follows:

The above object is also fulfilled by an optical disc reproducing apparatus for reproducing an optical disc, where the optical disc includes: a data area in which one or more video objects are recorded, where a video stream, a first audio stream, and a second audio stream are multiplexed into the one or more video objects; and a management area for storing one or more pieces of management information which respectively correspond to the one or more video objects, where the second audio stream has a bit rate with which audio data corresponding to a reproduction time period of the first audio stream is recorded into the second audio stream, where each of the one or more pieces of management information further indicates one of a first state, a second state, a third state, and a fourth state, where the first state indicates that the second audio stream includes the same audio data as the first audio stream, the second state indicates that the second audio stream includes audio data which has been generated from the same source as the first audio stream, the third state indicates that audio data of the second audio stream is irrelevant to audio data of the first audio stream, and the fourth state indicates that the second audio stream has ~~been~~ had dubbing performed ~~dubbing~~, the optical disc reproducing apparatus comprising: a reading unit for reading a video object and a piece of management information corresponding to the video object from the optical disc; a reproducing unit for reproducing the video stream and the first audio stream included in the read video object; a control unit for controlling the reproducing unit so that when the piece of management information indicates the fourth state, the reproducing unit is allowed to change reproductions of the first audio stream and the second audio stream in accordance with an instruction to change audio streams input from a user, and that when the piece of management information indicates either of the first state and the second state, the reproducing unit is not allowed to change reproductions of the first audio stream

and the second audio stream even when the instruction is input from the user, and the reproducing unit notifies the user that audio streams cannot be changed.

Please amend the paragraph at page 16, line 23, as follows:

With the above construction, the control unit controls the reproducing unit so that when the optical disc has ~~been~~ had dubbing performed ~~dubbing~~ (third state), the reproducing unit changes reproductions of the first audio stream and the second audio stream in accordance with an instruction from a user, and that when the dubbing has not been performed on the optical disc (first or second state), it notifies the user that audio streams cannot be changed. That is, the optical disc reproducing apparatus cautions the user that audio streams cannot be changed since dubbing has not been performed yet. The user is notified so for the following reason. If the first audio stream is changed to the second audio stream when the dubbing has not been performed on the optical disc (first or second state), the user may misunderstand the operation thinking that the reproducing apparatus has broken down and failed to change the audio streams since the user will hear the same sound.

Please amend the paragraph at page 27, line 3, as follows:

Also, as shown in FIG. 3D, in the innermost and outermost peripheries of the volume area, volume structure information is recorded to be used to deal with the disc as a logical volume. The rest of the volume area except the areas for recording the volume structure information is called a a partition area. The partition area records files. The logical block numbers (LBN: Logical Block Number) are assigned to sectors of the partition area in order starting from the first sector. Hereinafter, the logical block number is also called sector address.

Please amend the paragraph at page 28, line 24, as follows:

FIG. 6B shows a structure of the VOB in which elementary streams (video streams and audio streams) are multiplexed.

Please amend the paragraph at page 29, line 9, as follows:

The video stream 72 is a compressed data sequence with a variable-length bit rate, encoded in compliance with the MPEG2 standard. The video stream 72 includes a plurality of GOPs (Group Of Pictures) which each include a plurality of pictures. For example, as shown in the drawing, the video pictures 71 include compressed/encoded pictures which are any of I(Intra)-picture, P(Predictive)-picture, and B(Bidirectionally predictive)-picture defined in MPEG2 standard. Also, as indicated by the GOP 71a in FIG. 6B, each GOP includes at least one I-picture and is a video data section corresponding to a reproduction time period of about 0.5 seconds. This indicates that independent reproduction in units of about 0.5 seconds is possible. It should be noted here that the video pictures 71 in the drawing are shown in the order of decoding, not in the order of display.

Please amend the paragraph at page 31, line 5, as follows:

The above statement is explained more specifically. It is desirable that the audio stream (#1) 74 has the same bit rate and the same encoding mode as the audio stream #0. This is because, with the same bit rate and the same encoding mode, the optical disc recording apparatus can generate the audio ~~stream~~ streams #1 for dubbing without difficulty by copying the output of one audio encoder (the audio stream #0). This ensures that the audio stream #1 has the same audio quality as the audio stream #0.

Please amend the paragraph at page 17, line 14, as follows:

The above object is also fulfilled by an optical disc reproducing method for reproducing an optical disc, where the optical disc includes: a data area in which one or more video objects are recorded, where a video stream, a first audio stream, and a second audio stream are multiplexed into the one or more video objects; and a management area for storing one or more pieces of management information which respectively correspond to the one or more video objects, where the second audio stream has a bit rate with which audio data corresponding to a reproduction time period of the first audio stream is recorded into the second audio stream, where each of the one or more pieces of management information further indicates one of a first state, a second state, a third state, and a fourth state, where the first state indicates that the second audio stream includes the same audio data

as the first audio stream, the second state indicates that the second audio stream includes audio data which has been generated from the same source as the first audio stream, the third state indicates that audio data of the second audio stream is irrelevant to audio data of the first audio stream, and the fourth state indicates that the second audio stream has ~~been~~ had dubbing performed ~~dubbing~~, the optical disc reproducing method comprising: a reading step for reading a video object and a piece of management information corresponding to the video object from the optical disc; a reproducing step for reproducing the video stream and the first audio stream included in the read video object; a control step for, when the piece of management information indicates the fourth state, allowing the reproducing step to change reproductions of the first audio stream and the second audio stream in accordance with an instruction to change audio streams input from a user, and that when the piece of management information indicates either of the first state and the second state, not allowing the reproducing step to change reproductions of the first audio stream and the second audio stream even when the instruction is input from the user, and the reproducing step notifies the user that audio streams cannot be changed.

Please amend the paragraph at page 32, line 22, as follows:

In the DVD-RAM, each pack includes one packet. The pack is composed of a pack header and a packet. The pack has a fixed size of 2KB, which is the same as the sector size in the DVD-RAM. The pack header includes a pack start code, a System Clock Reference (SCR), and other data. The SCR is a kind of a time stamp and indicates a time at which the current pack passes through a demultiplexor of the reproducing apparatus. Here, the packs read from the DVD-RAM by the reproducing apparatus ~~is~~ are separated into video and audio packs by the demultiplexor. The video data or audio data of each pack is stored in the video buffer or audio buffer, and is decompressed (extended) by the video decoder or the audio decoder.

Please amend the paragraph at page 33, line 23, as follows:

In the present embodiment, the stream ID of the video stream is "1110 0000" as shown in FIG. 8. The stream ID of the audio stream encoded with the ~~MPEG~~ MPEG audio is "1100 0000" (in case of the audio stream #0) or "1100 0001" (in case of the audio stream #1), as shown in FIG.

9. As shown in FIGs. 10 and 11, the stream ID of the audio streams encoded with the AC-3 or the linear PCM is "1011 1101" which is equivalent to the private stream 1 defined in the MPEG 2. Furthermore, either of the AC-3 and the linear PCM, and, either of the audio stream #0 and the audio stream #1 are identified by the sub-stream ID included in the packet payload.

Please amend the paragraph at page 39, line 5, as follows:

The "Audio Flag" specifies an audio stream ~~which~~ that should be reproduced when the cell is reproduced. That is, the "Audio Flag" indicates the audio stream #0 when the flag has value "0," and indicates the audio stream #1 when it has value "1."

Please amend the paragraph at page 39, line 15, as follows:

FIG. 14 shows a relationship ~~between~~ among several pieces of information indicated by respective values of the "Application Flag" of the "Audio1 Attribute" in a VOB shown in FIG. 12.

Please amend the paragraph at page 46, line 5, as follows:

In the above (a) process, the system encoder 2e fetches the video stream and the audio stream #0 respectively from the video buffer 2b and the audio buffer 2d and sequentially generates video packs (V_PACKs) and audio packs (A0_PACKs). In the above (b) process, the system encoder 2e generates audio packs (A1_PACKs) of the audio stream #1. In this process, the system encoder 2e generates A1_PACKs by copying the A0_PACKs of the audio stream #0 into the A1_pack buffer 2e1, and rewriting a part of the pack header and the packet header. In the multiplexing in the above (c) process, the system encoder 2e sequentially outputs the V_PACK, A0_PACK, and A1_PACK one by one in the order indicated by the SCR. By repeating this, the system encoder 2e outputs these packs as ~~VOB~~ VOBs to the disc access unit 3.

Please amend the paragraph at page 46, line 18, as follows:

FIG. 25 shows the VOBs output from the system encoder 2e. In the drawing, "V" represents a video pack (V_PACK), "A#0" an audio pack of the audio stream #0 (A0_PACK), "A#1" an audio pack of the audio stream #1 (A1_PACK). Each pair of the A1_PACK and the A0_PACK

corresponding to each other ~~have~~ has the same audio data, but has different stream IDs (or sub-stream IDs) and different SCRs. The SCR of the A1_PACK of a pair is equal to the SCR of the A0_PACK of the pair plus a predetermined value α , so that they are multiplexed to be located at adjacent or near places in the VOB.

Please amend the paragraph at page 49, line 4, as follows:

Since the switches 3d and 3e ~~operates~~ operate as described above, the reading from the optical disc or the writing onto the disc can be performed in parallel with the rewriting of the audio stream #1 performed by the MPEG encoder 2. For example, the reading of data from the optical disc and the storing of the read data into the track buffer 3a3 can be performed in parallel with the updating of the audio stream #1 stored in the track buffer 3a1 and the storing of the updated audio stream into the track buffer 3a2. This makes it possible to perform the dubbing in real time while the disc is reproduced.

Please amend the paragraph at page 49, line 15, as follows:

When the user presses the RECORD key on the remote controller 6, the control unit 1 is notified of it via the remote controller signal receiving unit 8 and the bus 7 shown in FIG. 16.

Please amend the paragraph at page 50, line 4, as follows:

The system encoder 2e generates the audio stream #1 while fetching the video stream and the audio stream #0 respectively from the video buffer 2b and the audio buffer 2d, and multiplexes the three ~~stream~~ streams into VOBs and outputs the VOBs to the disc access unit 3 via the bus 7.

Please amend the paragraph at page 52, line 3, as follows:

The simulation of occupation of the audio decoder buffer by audio data is similar to the simulation of the video decoder buffer shown in FIG. 26. However, the audio stream has a far smaller amount of data (bit rate) than the video stream. Also, the capacity of the audio decoder buffer (4KB according to the standard) is smaller than that of the video decoder buffer.

Please amend the paragraph at page 52, line 9, as follows:

The system encoder 2e determines whether a pack ~~of which~~ of video data ~~and or~~ audio data should be generated, in accordance with the amount of data stored in the video buffer 2b and the audio buffer 2d (step 222).

Please amend the paragraph at page 52, line 13, as follows:

When determining that the pack should be a pack of ~~as~~ video data in step 222, the system encoder 2e fetches a predetermined amount of video data (equivalent to the size of the payload field of the video packet) from the video buffer 2b (step 223), and attaches the packet header and the pack header to the fetched video data (step 224).

Please amend the paragraph at page 52, line 18, as follows:

When determining that the pack should be a pack of ~~as~~ audio data in step 222, the system encoder 2e fetches a predetermined amount of audio data (equivalent to the size of the payload field of the audio packet) from the audio buffer 2d (step 225), and attaches the packet header and the pack header to the fetched audio data (step 226). A pack for the audio stream #1 for dubbing is then generated from the pack for the audio stream #0. That is, the pack for the audio stream #1 is generated by copying the pack for the audio stream #0 (step 227).

Please amend the paragraph at page 55, line 12, as follows:

When the user presses the DUBBING key on the remote controller 6 after specifying PGC, the control unit 1 is notified of it via the remote controller signal receiving unit 8 and the bus 7 shown in FIG. 16.

Please amend the paragraph at page 58, line 2, as follows:

Each time a VOB included in a PGC is dubbed, the control unit 1 updates the application flag of the audio ~~streams~~ stream #1 of the corresponding VOB information to "dubbing audio data," without updating the application flag of the audio ~~streams~~ stream #0. The reason for not changing the application flag of the audio ~~streams~~ stream #0 is as follows. Even after the audio stream #1 is

dubbed, it is possible to return the dubbed audio stream #1 to the state before dubbing without encoding when the application flag of the audio streams #0 is "same audio data," or without re-encoding the decoded audio signal when the application flag of the audio streams #0 is "nearly same audio data." This arrangement is useful for the user. For example, when the user has failed to perform dubbing, the user can judge whether the dubbed audio stream #1 can be returned to the state before dubbing by referring to the application flag of the audio stream #0, and if it can, the user can perform the dubbing again after returning the dubbed audio stream #1 to the state before dubbing.

Please amend the paragraph at page 58, line 20, as follows:

When the user presses the PLAY key on the remote controller 6, the control unit 1 is notified of it via the remote controller signal receiving unit 8 and the bus 7 shown in FIG. 16. After receiving this notification, the control unit 1 determines a VOB by reading out the PGC information and the VOB information from the AV data management file. In doing so, the control unit 1 also determines which of the audio streams #0 and #1 should be reproduced by referring to the audio flag included in the PGC information, and notifies the MPEG decoder 4 of the determination result.

Please amend the paragraph at page 65, line 15, as follows:

The dubbing unit 2m has, as well as the functions of the dubbing unit 2h, ~~has~~ a function to replace, for each VOB, the data stored in the payload field of the SP PACKs with the contents of the SP stream stored in the SP buffer. For this purpose, the dubbing unit 2m has a pack buffer 2m1 for storing the SP packs of the VOB used for the above replacement.